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Analysis of Fire Hazards of Billboards on Exterior Walls of Buildings and Fire Control Safety Countermeasures

ZHOU Bai-xia*

Kunming Fire Service Training School, Kunming 650208, China

Abstract

Fires on buildings that are triggered by fires on billboards of exterior walls of buildings have occurred in China during recent years, and the billboards spread the fire and hinder fire-fighters from putting out the fire. The thesis has analyzed fire hazards due to billboards on exterior wall of buildings, including hazards to easily trigger fires, spread fires, affect personnel evacuating and fire extinguishing, etc. According to current fire control technical laws and regulations, the thesis proposes the fire control safety countermeasures like preparing laws & regulations, applying and promoting new material & technology, observing electric installation regulations, installation positions guaranteeing smooth smoke evacuation and heat dissipation, installation quantity and size to ensure fire control fire fighting coverage not to be affected , etc.

Keywords: fire control; billboard on exterior wall; fire hazard; fire control safety

1. Introduction

As China's commerce and advertising develops rapidly, increasingly more billboards on exterior walls of buildings emerge, and dazzling spotlight billboards, neon billboards, painting billboards, lamp box billboards, etc. are universally set on exterior walls of places with a dense population such as high-rise buildings, shopping malls, hotels and stations. As China has not had any design, mounting and administrative regulations concerning billboards on exterior walls of buildings yet, the fire control management is out of order, thus resulting in increasingly severe fire control problems.

Table 1.The fire cases of buildings' exterior wall billboards caught fire or accelerated the fire in recent years of China.

Time	Burning building	Cause of fire	Fire hazards
Dec.12.2007	"Wenfu Building" , Wenzhou	A combustion source ignited an outdoor billboard of Red Flower Shop, which spread the fire to an extra-large outdoor billboard and then the 2nd floor.	21 people died 2 people injured
Apr.15.2010	"Xianghong Guest room" in the northwest of "Wenyi road" crossing, Changsha	A painting billboard on the top of "Xianghong Guest room" in Changsha City caught fire suddenly	The billboard was burned to a white board in a minute, then causing building fire.
Mar.17.2010	"Yunzhong Building", Duyun	The large exterior wall billboards greatly blocked the fire-fighting, delaying the fire-fighting time.	The fire was put out after 5 hours.
Apr.24.2010	"Saibo"Digital Square, Chongqing	A billboard in Shiqiaopu of New and High-Tech Zone was on fire in dismantling process, and the fire spread to the Foxconn's building.	Seven floors were burnt to the ground.

* Corresponding author. Tel.: +86-871-7210444-8150; fax: +86-874-7210444

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Mar.28.2010	"Tianyuan Commercial Building", Changchun, Jilin	The outer wall billboard promoted the flames and hindered fire fighting.	The fire lasted for 12 hours. More than 20 million was lost.

2. Analysis of Fire Hazards of Billboards on Buildings' Exterior Walls

Exterior walls of buildings, especially those at the front in urban areas, are of great concern as the ideal place for many merchants and advertising companies to put on advertisements. However, absence of standard administration over billboards on buildings' exterior walls results in fire hazards for building fire control safety, which are mainly displayed in the following respects:

2.1. Easily Trigger Fires When Mounting Outdoor Billboards on Buildings

Outdoor billboards of buildings are mostly made of metal, foam, plastic, board, painting advertising paper, etc., generally installation personnel in the exterior wall of densely populated places use electric welding and gas welding during mounting and fixation, the high-temperature welding slag and sparks generated are easy to set fire to combustible materials nearby, and especially they splash into interior parts of buildings, cause fire accidents and result in major property loss and casualty. On the evening of February 5, 1996, Chongqing Tianyu Advertising Company broke rules and used electric welder to mount billboards on the rooftop of Chongqing Qunlin Domestic Product Boutique Shopping Mall in Jiefangbei, and fire occurred as high-temperature welding slag splashed on combustible materials on the 2nd floor. The fire lasting for over 5h hit 6 enterprises, 43 residential apartments were ruined, and 5 people died, making it the largest commercial building fire in Chongqing since New China was founded.

2.2. Electric Equipment Faults of Billboards on Buildings' Exterior Walls Easily Trigger Fires

In order to make billboards more eye-catching, a number of merchants and advertising companies set lighting devices in or near billboards, which are in a large number and of large powers, and because electric circuits are complicated with many joints, and the wirings are not standards, so electric circuit and electric equipment within billboards cause fire easily. Especially after lighting devices of large powers or tubes with ballasts run for a long time, combustible materials near high-temperature lighting devices or ballasts may be heated and then burned, causing fires.

2.3. Billboards on Buildings' Exterior Walls Crippled Buildings' Fire Compartment and Help Fire Spread

Billboards on buildings' exterior walls, especially those on shopping malls, hotels and high-rise buildings in urban commercial areas, may be tens of meters wide and high. Large area billboards are mounted close to exterior walls and form gaps of different sizes between exterior walls of buildings. These gaps span over several floors in the longitudinal direction and connect several independent compartments on the same floor, thus destroying fire compartments of buildings' exterior walls. Once billboards are on fire or some interior part of the building is on fire, the fire will rapidly spread to other floors and rooms along billboards. Huangyan fire, which happened on February 14, 2007, spread through billboards of buildings' exterior walls, and led to disaster.

2.4. Billboards on Buildings' Exterior Walls Affect Natural Lighting and Therefore Evacuation of People

Safe evacuation of people easily becomes a chaos due to fire, and better evacuation lighting is required. However, when fire occurs, ordinary power supply is cut off, and lighting devices in buildings are powered off. According to standards, then emergency lights are expected to provide lighting for evacuation, but the allocation, administration and quality of emergency lights in many places of China cannot guarantee power supply light and luminance, while huge billboards on buildings' exterior walls block natural lighting or external lighting and hence affect safe evaluation of people in buildings.

2.5. Billboards on Buildings' Exterior Walls Seal Windows and Affect Smoke Exhaust and Heat Dissipation

There are mainly two ways of smoke discharge in buildings: natural and mechanical smoke discharge, of which natural smoke discharge accounts for a large proportion. Natural smoke discharge way, using hot smoke airflow's buoyancy and external wind effects caused by fire, discharges smoke out through windows. According to national technical standards, the effective area of smoke vents in interior corridors not longer than 60m or rooms with smoke discharge needs should not be smaller than 2% of buildings' floor area, but billboards on exterior walls of buildings partly or completely block and seal

windows of buildings, reduce or seal natural smoke vents, so dense smoke cannot be discharged timely when fire occurs, and high-temperature dense smoke stays in buildings for a long time, sets fire to combustible materials where smoke comes, consumes a great amount of oxygen, generates a great amount of poisonous gases, and causes casualty due to high temperature, oxygen deficiency, poisoning and suffocation.

2.6. Billboards on Buildings' Exterior Walls Make Escape and Rescue from Windows Difficult

When fire occurs, people in buildings escape to safe areas mainly through emergency staircase, but owing to chimney effect of vertical emergency staircase, smoke goes into staircases easily. Since staircases are sealed by smoke and fire, people in lower floors or evacuated to relatively lower floors in buildings may utilize exterior walls of buildings and escape from windows with the aid of relevant facilities. Fire-fighters may enter into buildings rapidly with the help of climbing facility through exterior windows to put out fire and search for people, but escape from windows and rescue cannot be realized as exterior windows are sealed by billboards on exterior walls.

2.7. Billboards on Buildings' Exterior Walls Make Fire Extinguishing Difficult

Efficient fire fighting means fire-fighters should try to spray fire extinguishing agents to the surface of things on fire to efficiently reduce the temperature of burning things, isolate contact between burning things and outside, and slow down thermal decomposition of combustible materials. Therefore, it is regulated that "fire fighting coverage of buildings and fire engine extinguishing operating venue should meet fire engine extinguishing operation requirements". However, huge billboards of exterior walls on buildings destroy fire fighting coverage, and prevent water from being injected to parts of buildings on fire.

3. Countermeasures to Improve Fire Control Safety of Billboards on Exterior Walls of Buildings

Billboards of exterior walls on buildings are striking and long-lasting and have pretty good advertising function; some billboards are combined into exterior wall decoration of buildings and become a part of the wall. Billboards of exterior walls on buildings play an important role in publicizing commodities and beautifying exterior walls, but they also throw fire control safety problems of buildings. Fires of billboards on exteriors walls taking place recently warn us we should strengthen study on fire control of billboards on exterior walls of buildings to guarantee fire control safety.

3.1. Promulgate Fire Control Safety Standards or Requirements concerning Setting of Billboards on Exterior Walls of Buildings

Billboards on exterior walls of buildings could beautify buildings and serve as advertisements, so they develop quickly. However, there are almost no fire control requirements for them. Fire control sectors should add fire control safety standards in current building fire control design standards or other fire control regulations and rules, and get billboard production material, electric wires, lighting devices, mounting positions, sizes, etc. involved in the administrative scope of police and fire control sectors' supervisory inspection.

3.2. Encourage New Material and Technology for Production of Billboards on Exterior Walls of Buildings

Currently billboards on exterior walls of buildings are mostly made of plastics, plastic gusset plate and wood. Once fire occurs, it will spread quickly and produce dense smoke and quite poisonous flue gas, which are not in favor of fire control and evacuation of people. New technology, medium, material and process are recommended in production of billboards like LED display; combusting performance of material should be improved and incombustible or nonflammable materials should be adopted as much as possible; wooden materials should be painted with fireproof coating for fire retardant treatment to avoid expanding of fires.

3.3. Standards for Electric Installation of Billboards on Exterior Walls of Buildings

Electric fire frequents concerning billboards on exterior walls of buildings, and especially some billboards easily trigger fires on thunderstorm days. Therefore, billboards on exterior walls of buildings should not use lighting devices of larger powers inside of or near billboards according to national electric technical standards like "Standard for Construction and Check & Acceptance of Electric Lighting Devices in Electric Device Installation Projects"; electric equipment and parts that easily generate high temperatures like ballasts should not be close to combustible materials; electric wires inside of billboards should be installed in metal sleeves or fire-retarding plastic sleeves; lightning protection measures should be

taken for billboards.

3.4. Mounting Positions of Billboards on Exterior Walls of Buildings should guarantee smooth smoke discharge and heat dissipation

Exterior windows of buildings are main smoke discharge and heat dissipation channels after fire occurs, so billboards on exterior walls of buildings should not be close to or sea exterior walls of buildings to prevent high-temperature and poisonous flue gas from lingering in buildings and affecting life safety of people inside.

3.5. Mounting Quantity and Size of Billboards on Exterior Walls of Buildings should Ensure Fire Fighting Coverage

Billboards on exterior walls of buildings should follow the principle of not affecting escape of people, not affecting emergency rescue and favoring of fire control safety, and sizes and quantity of billboards set on exterior walls of buildings should be subject to fire control technical standards. Billboards set in densely populated places such as high-rise buildings, hotels and shopping malls should not cross layers vertically and not span independent compartments horizontally to ensure fires in buildings or on billboards will not facilitate fire spreading or affect escape of people and rescue.

4. Conclusions

Billboards on exterior walls on buildings could promote urban commerce development, trigger fires as well, accelerate fire spreading, and affect fire extinguishment and escape. Police, fire control sectors, advertising, urban management, etc. in charge should analyze fire hazards, take effective countermeasures and strengthen fire control supervision and management over billboards on exterior walls of buildings. Billboard setting units should “set billboards not to hinder social security, endanger personnel and property safety and damage social and public interests” according to article 7 in “Advertising Law of the People's Republic of China” and set billboards on exterior walls of buildings scientifically and reasonably. Fortunately many cities in China have revised and promulgated urban outdoor advertisement management regulations successively and some have proposed clear requirements for safety of billboards on exterior walls of buildings. For example, article 15 in “Kunming Municipal Outdoor Advertisement Management Regulations” stipulates: outdoor advertising facilities by utilizing buildings should be inlaid or attached to façade of buildings and not affect safety of buildings. Some cities at home have carried out special rectification work concerning fire control safety of billboards on exterior walls of buildings, required to dismantle billboards that affect fire extinguishment and evacuation of people, and firmly removed necessary ones to ensure fire control safety of buildings.

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